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## *SUGAR PRICES FOR MONTH ENDING APRIL 13, 1909.*

| | | Centrifugals. | Beets. | Parity. |
|---|---|---|---|---|
| March | 13, 1909..... | 3.81¢ | 10s 3¾d | 4.18¢ |
| " | 15, 1909..... | 3.86¢ | 10s 4½d | .... |
| " | 16, 1909..... | 3.885¢ | 10s 4½d | .... |
| " | 17, 1909..... | 3.92¢ | 10s 4½d | .... |
| " | 18, 1909..... | 3.92¢ | 10s 6d | .... |
| " | 19, 1909..... | 3.02¢ | 10s 6d | .... |
| " | 20, 1909..... | 3.92¢ | 10s 5½d | .... |
| " | 22, 1909..... | 3.92¢ | 10s 5½d | .... |
| " | 23, 1909..... | 3.92¢ | 10s 4½d | .... |
| " | 24, 1909..... | 3.92¢ | 10s 4½d | .... |
| " | 25, 1909..... | 3.92¢ | 10s 5½d | .... |
| " | 26, 1909..... | 3.9875¢ | 10s 5½d | .... |
| " | 27, 1909..... | 3.9925¢ | 10s 5½d | .... |
| " | 29, 1909..... | 3.99¢ | 10s 5½d | .... |
| " | 30, 1909..... | 4.02¢ | 10s 5½d | .... |
| " | 31, 1909..... | 4.02¢ | 10s 5½d | .... |
| April | 1, 1909..... | 3.99¢ | 10s 4½d | .... |
| " | 2, 1909..... | 3.99¢ | 10s 5¼d | .... |
| " | 3, 1909..... | 3.99¢ | 10s 4½d | .... |
| " | 5, 1909..... | 3.99¢ | 10s 4½d | .... |
| " | 6, 1909..... | 3.985¢ | 10s 3¾d | .... |
| " | 7, 1909..... | 3.955¢ | 10s 3¾d | .... |
| " | 8, 1909..... | 3.955¢ | 10s 3¾d | .... |
| " | 9, 1909..... | 3.955¢ | 10s 3¾d | .... |
| " | 10, 1909..... | 3.955¢ | 10s 3¾d | .... |
| " | 12, 1909..... | 3.955¢ | 10s 3¾d | .... |
| " | 13, 1909..... | 3.92¢ | 10s 3¾d | .... |

## *NOTES.*

THE TARIFF BILL.—The long heralded Payne tariff bill introduced in the House of Representatives on the 17th of March, offers no change in the present rates of duty of 1.685c. on 96° test sugar from non-privileged countries and 1.348c. on Cuban 96° test; it admits up to 300,000 tons of sugar per year from the Philippine Islands free of duty, the excess of 300,000 tons to pay full tariff rates. The bill proposes to reduce the duty on refined sugar from 1.95c. to 1.90c. per pound.

A very interesting situation has developed over the provision relating to Philippine sugar. It is understood that the admission of 300,000 tons per year free of duty was a compromise arrived at between President Taft and the mainland sugar producers. Immediately that this proposal was made known there were protests and lamentations from the Philippines, and organized bodies in Manila sent on delegations to repudiate any such measure and to demand unlimited free trade or nothing. How annoyed and displeased the President is with such action may well be imagined.

The provision in the Payne bill that "all articles, wholly the growth and product of the United States, shall be admitted to the Philippine Islands from the United States free of duty" has also raised a howl. The importation of free goods from the United States will tend to build up a trade with the Mainland, and as this trade develops and supplants that of other countries there will be a very perceptible decrease in customs revenues, which are all turned back into the Philippine treasury. The commissioners from the Philippines to the United States Congress have been instructed by the Philippine Legislature to seek the abolition of the Dingley tariff on sugar to the extent of 400,000 tons, and on unmanufactured tobacco to the amount of seven million pounds, (the Payne bill providing for the admission free of duty of three million, three hundred thousand pounds of wrapper and filled tobacco); and to obtain the abolition of the duty without special concessions to the United States.

During a discussion of the sugar schedule in the House of Representatives Mr. Broussard of Louisiana stated "that it is the opinion of the administration of the Philippine Islands that sugar can be produced in the Islands to supply not only the United States but the entire world." And with the duty removed this result would not be many years in arriving.

To top the situation information comes that Cuba is not satisfied and Vice-President Zayas is in Washington to negotiate a new reciprocity treaty with the United States, the basis of which will be greater tariff concessions on sugar and tobacco.

Should the sugar schedule in the Payne bill and the provision allowing the importation of 300,000 tons of Philippine sugar free of duty, be adopted, there is assurance that no further tariff

changes as to sugar will be undertaken during the Taft administration. Representative Fordney of Michigan stated during the course of his speech on the Payne bill that President Taft has agreed "that during his administration he will not permit, as far as he can avoid it by his action, any further reduction in the sugar schedule if the sugar interests will accept this agreement and let the 300,000 tons come in free from the Philippines."

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CANE HARVESTING MACHINES.—Mr. C. E. Piatt of Louisiana, the inventor of a cane harvester, has returned to Louisiana without trying his machine. Every assistance possible was offered Mr. Piatt to make his first trial, but after viewing the cane at Ewa plantation he stated that his harvester would not operate in the uneven, crooked rows and that it would be useless to make a trial.

At a recent meeting of the Louisiana Sugar Planters' Association, A. N. Hadley, the inventor of a corn harvester, stated that he had constructed a machine which would cut, top, strip and load cane, and under the conditions existing in Louisiana would harvest an acre of sugar cane an hour. He stated that the machine in its experimental trial had far exceeded his expectations and that by the coming fall he would be able to operate it on a commercial scale.

The great majority of sugar cane growers have come to look upon such propositions with much scepticism, and in Mr. Hadley's instance, even in the face of his positive statements, he was subjected to some good-natured "jollying."

Some day with perhaps a change in the method of planting and cultivation, or in the varieties of cane grown, a machine will be constructed that will perform this laborious and expensive hand work. At present it certainly seems an impossibility.

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SAVINGS OF LABORERS.—A very sufficient answer to the statement of the agitators who are seeking to induce the Japanese laborers on the plantations to strike for higher wages, that such laborers are not earning at the present rates of wages enough to support themselves and families, is to be found in the statistics of the Money Order Department of the Post Office for the past three years.

These show that money orders issued in Hawaii (all offices), payable in Hawaii, shows an excess in favor of Japan as follows: lows:

| | |
|---|---|
| 1906 | $ 609,827.50 |
| 1907 | 925,532.46 |
| 1908 | 1,168,173.97 |

Money orders payable in Hawaii, certified to by the Honolulu office from Japan:

| | |
|---|---|
| 1906 | $ 14,400.70 |
| 1907 | 31,835.78 |
| 1908 | 13,900.46 |

The difference in the amounts of the money order funds certified to, and payable in Japan, and the amount certified from Japan payable in Hawaii, shows in favor of Japan as follows:

| | |
|---|---|
| 1906 | $ 589,684.87 |
| 1907 | 882,029.34 |
| 1908 | 1,144,049.96 |

It is believed a very considerable portion of this large amount of money is sent to Japan for deposit in the Postal Savings Banks of that country, with which system the Japanese are familiar.

In addition to these amounts large sums of money are being sent annually to Japan through the Japanese banks. A portion of the money sent to Japan is, of course, in payment for merchandise imported, but it is very safe to say that the post office money orders and a considerable part of the exchange issued by the banks represents the savings of laborers.

The Japanese laborers on the plantations as a class are easily moved and are quick to resent any grievances. That the agitation which has been continuously conducted for so long has not resulted in wide-spread strikes is due to the fact that a great majority of the laborers are earning as much or more than is being demanded by the agitators.

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PORTUGUESE FROM THE EAST.—By the S. S. "Makura" there arrived April 2, about forty Portuguese recruited by the Board of Immigration in the vicinity of New Bedford, Providence and Fall River, and it is expected that others will follow. All of these people accepted work on the plantations and preliminary reports are to the effect that they are doing well.

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MAURITIUS AND HAWAII.—In all journals devoted to sugar production we read much of the industry as carried on in Mauritius, but as to the country in general and its people we know very little. Dr. W. D. Alexander recently presented to the Social Science Club a very interesting paper, comparing our own islands with Mauritius, which we are permitted to publish in this issue.

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CUBAN SUGAR.—From Habana, Consul-General James L. Rodgers reports, under date of March 5, that a decidedly optimistic opinion as to the sugar and tobacco production of this year now prevails in Cuba. His details follow:

While the abundant rains, especially in the eastern half of the island, have given some warrant for the belief that the sugar production would be curtailed, there is yet such a fine growth of cane in nearly all sections that low estimates of the yield are generally discredited, although everyone must admit that the outcome must depend entirely upon the weather of the early spring. It only seems safe to state that if the grinding season is approximately

identical with that of 1908 there will be at least a near approach to the accepted estimate of 1,400,000 tons. However, the qualifying statement is to the effect that the spring of 1908 was abnormally dry and that there is evidence of the reverse this year. So the estimate of 1,300,000 tons is the favorite one of the conservative.

The prevailing good prices of Cuban sugars and the hope of a continuance, however, make the outlook satisfactory to both the pronounced optimist and the conservatives. There is little ground for the pessimist upon any condition relating to the volume and price of the output.

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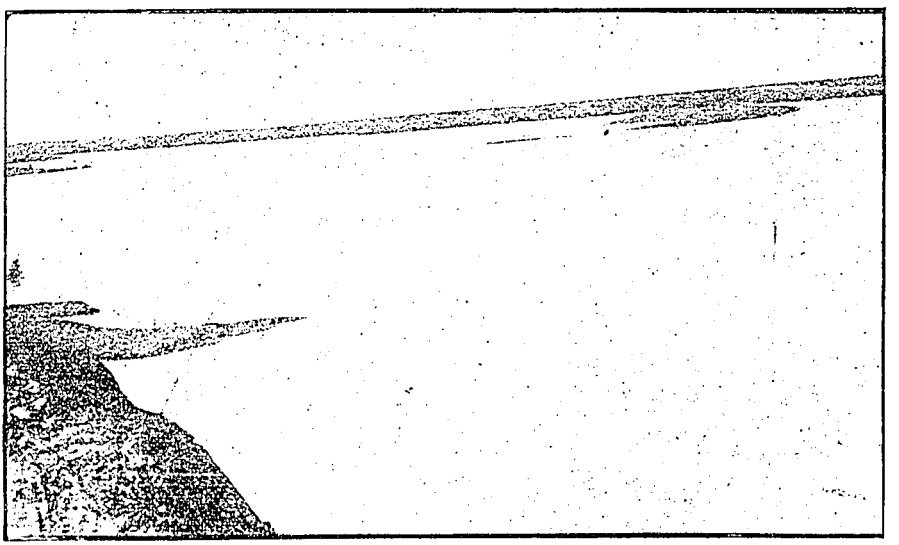
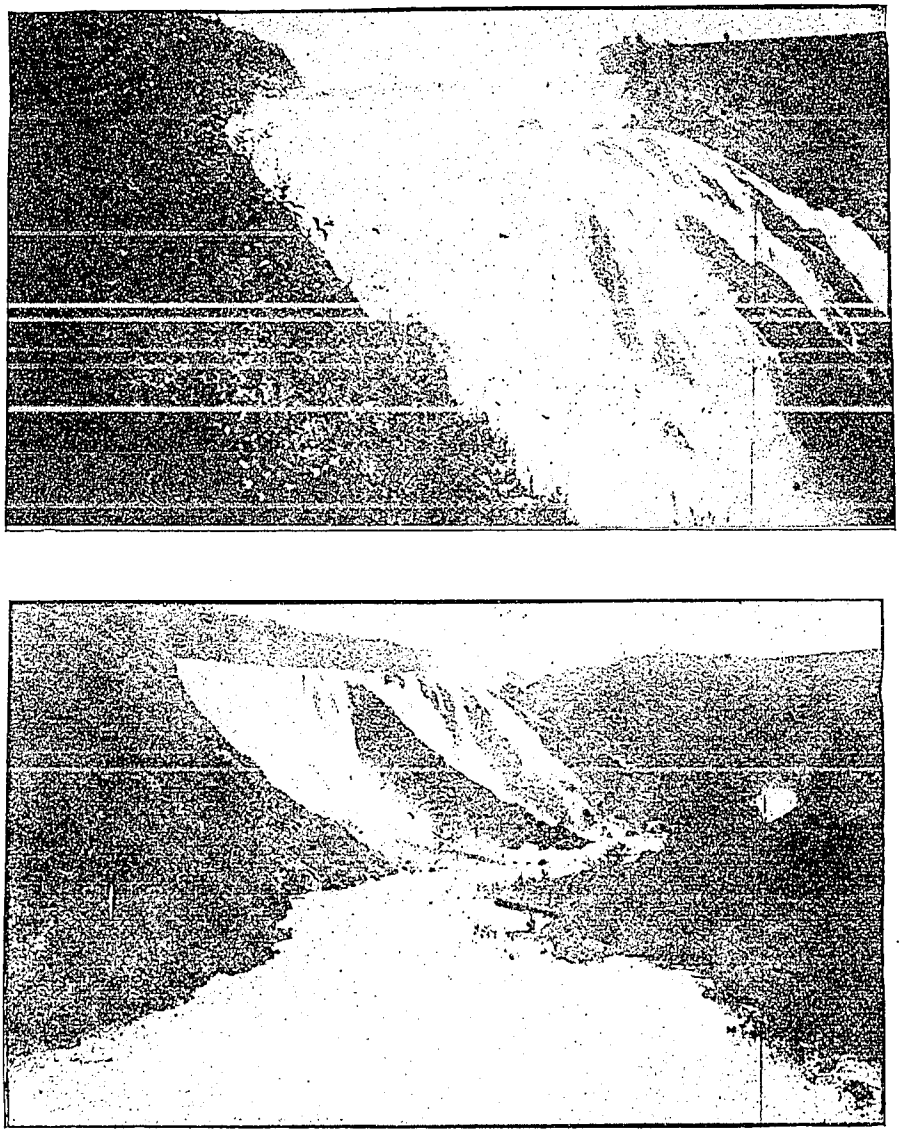
## *WAHIAWA RESERVOIR.*

For the second time since its completion in 1905 the Wahiawa reservoir of the Waialua Agricultural Company overflowed through the spillway. On April 1st due to heavy and continuous rains in the mountains the water in the reservoir reached its greatest height and nineteen inches flowed through the spillway; on the following day, when the photographs from which the cuts here shown were taken, the height of the water had decreased seven inches.

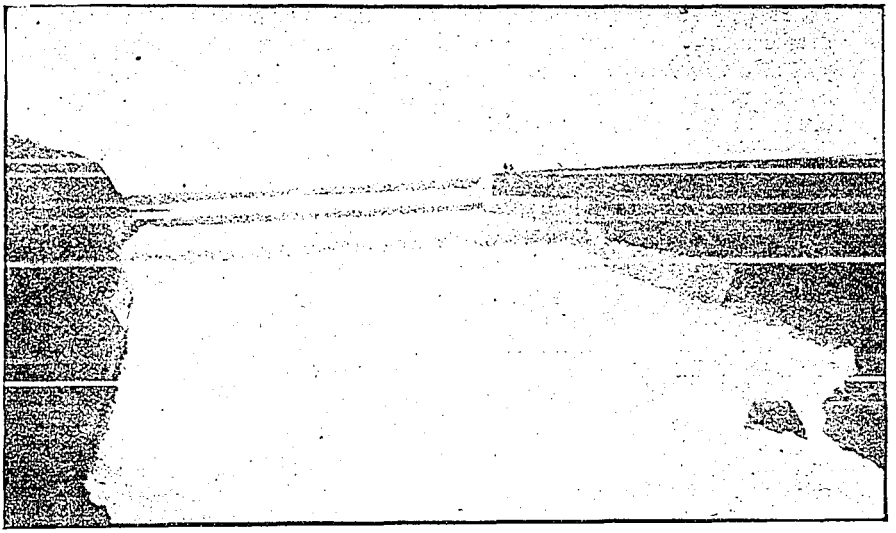


The Wahiawa Reservoir April 2, 1909. Depth of water 81 feet.



Wahiawa Reservoir April 2, 1909. Water going over the bluff below the spillway.

The overflowed area at the depth shown in the cuts was over 700 acres and the capacity of the reservoir 2,500,000,000 gallons. The dam is about 100 feet above the level of the stream across which it was built, 420 feet in depth, 400 feet across the top, contains 141,000 cubic yards of earth, 26,000 cubic yards of stone and 108,000 feet of 12x12 selected and well seasoned redwood in the bulkhead.



The Wahiawa Reservoir. Twelve inches of water going through the spillway, April 2, 1909.

## *REPORT OF TERRITORIAL BOARD OF IMMIGRATION.*

The second report of the Board of Immigration of the Territory of Hawaii, covering the period from December 31, 1906, to February 28, 1909, has recently come from the press. During this period the project of bringing in European laborers was brought to an end by legislation which prohibited the conduct of such immigration with funds contributed by corporations. During the activity of the Board there were imported 4,684 persons at a total cost of $291,109.53. Of this number 47 were rejected because of contagious diseases and returned home at an expense of $11,119.02.

During 1908, through the efforts of the Board, 500 Portuguese and others, many of whom had formerly resided in Hawaii, were recruited in California, at an expense of $14,161.93.

The principal effort of the Board outside of direct European immigration has been to obtain immigrants at the Eastern ports of entry of the United States, which was an experiment undertaken with much doubt as to its ultimate results. In this connection it is stated in the report as follows:

"It was suggested to the Board by the Department of Commerce and Labor during the early part of 1908 that it might be possible to recruit, at the eastern ports of entry of the United States admitted aliens for agricultural purposes upon the properties of the various agricultural enterprises in the Territory. Acting upon this suggestion the Board invited to the Territory an agent thoroughly familiar with the immigration question and in whom the authorities in Washington had every confidence. This agent, Mr. John J. D. Trenor, during the months of May, June and July, 1908, made a thorough investigation of the conditions of the various sugar estates, familiarizing himself with the local conditions and with the inducements there were in the Territory for possible emigrants.

"On August 3, 1908, Mr. Trenor filed his report with the Board from which after further discussion with the President of the Board the following conclusions were drawn:

"1st. That the quarters furnished to ordinary laborers upon the various sugar estates in the Territory are, upon the whole, and with very few exceptions, comfortable and commodious; that the treatment afforded them is kind and considerate and that the wage paid is fair as compared with that paid for like labor performed elsewhere."

"2nd. That no climatic conditions exist which prevent a laborer working practically every day in the year and that the opportunity to so work would be afforded him if he so desired."

"3rd. That upon the whole, and taking the year around, the average field laborer in this Territory will earn as much at the wages offered as an ordinary laborer upon the mainland doing the same class of work."

"4th. That it is reasonable to believe that a carefully selected colony of Europeans brought from an Eastern port of entry and settled upon one of our plantations would find all conditions satisfactory and would remain permanently in the Territory, with a prospect of such a colony endeavoring to persuade their friends upon the mainland to join them here."

"5th. That from Mr. Trenor's experience and from the result of his study of conditions he advised us to make our initial experiment with a colony of Italians originally entering the mainland from the south of Italy."

In accordance with the above, the Board authorized the superintendent to employ Mr. Trenor to act as agent of the Board in

recruiting such persons at eastern ports of entry, this arrangement to date for one year from August 15, 1908. In accordance with the agreement Mr. Trenor was to establish an office in New York City and to ascertain whether or not it would be possible to secure fifty families of Southern Italians for agricultural laborers in the Territory. Mr. Trenor was employed at a salary of $6,000 per annum with $4,000 per annum additional for office expenses, rent, pay of assistants and traveling expenses.

Mr. Trenor opened his office in New York on October 1, 1908, and has since made monthly reports to the Board as to the progress of his work. He has been able to establish negotiations with various prominent Italian societies in New York, supplying them with information in regard to conditions in Hawaii, and at the same time has kept in touch with the Federal authorities in Washington. A great deal of other preliminary work has been done by him in distributing information generally, in preparing statistics as to cost of transportation and in looking into available sources of supply. In connection with his work he has looked into a probable source of supply of Portuguese persons residing in the State of Massachusetts, and the first lot of these Portuguese are now on their way to Hawaii.

"The work thus far done by Mr. Trenor has been largely preliminary, the object being to get the true facts as to conditions in Hawaii in a thorough manner before not only persons who might emigrate to Hawaii, but others who either wholly or in part, control or have some interest in such immigration, including the leaders of Italian societies in New York State and the Federal authorities at Washington. Mr. Trenor has been considerably assisted in this work by the interest taken therein by the Department of Commerce and Labor and the Department of the Interior. It is probable that further results of this preliminary work will be obtained in the near future.

"In the meantime it has been suggested that a further attempt be made to induce Porto Ricans to emigrate to Hawaii. Mr. Trenor has been in correspondence with Governor Post of Porto Rico concerning this matter, but no further steps have been taken as it has not been felt advisable, at this time, to actively engage in inducing such emigration.

"Mr. Trenor has been able to present the matter of emigration of Southern Italians now in the States to the representatives of the Italian government in the United States and also to secure their interest therein. It is, of course, understood that all these efforts are being directed to the inducement of immigration of persons who are already within the United States."

At the end of the report is given a summary of the average cost of European immigration conducted by the Board. The cost of this immigration was considerably lower than in enterprises of the same nature heretofore conducted by the Government or the Planters. The summary is as follows:

AVERAGE COST OF EUROPEAN IMMIGRANTS EX STEAMERS "SUVERIC", "HELIOPOLIS" AND "KUMERIC".

| | Men | Women | Children | Total | Per Male | Per Capita |
|---|---|---|---|---|---|---|
| "Suveric" | 459 | 283 | 582 | 1324 | $153.55 | $ 53.23 |
| "Heliopolis" | 608 | 554 | 1084 | 2246 | 235.22 | 63.68 |
| "Kumeric" | 333 | 306 | 475 | 1114 | 233.08 | 69.67 |
| | | | | | $621.85 | $186.58 |

Total men ..... 1,400
Total women ..... 1,143
Total children ..... 2,141
Total immigrants ..... 4,684
Combined average cost of males ..... $207.28
Combined average cost per capita ..... $62.19

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## *PROF. KOEBELE'S WORK ON HORN-FLY.**

On April 9th, 1908, I wrote Mr. Koebele final instructions as to leaving for Europe in search of horn-fly parasites, and other natural enemies of that pest. Owing to various circumstances it was not till considerably later that he was able to leave New York for Germany. I had requested him, if possible, to call on Dr. Howard, the chief of the Division of Entomology, at Washington, as I had understood that that Division might be doing work of the same nature in Europe, as we were about to attempt. Mr. Koebele was unable to see Dr. Howard personally, but, after correspondence, informed me that work on the horn-fly on these lines would not be undertaken by the entomologists of the Washington Department.

During the summer months Mr. Koebele's time was entirely occupied in making observations in the field, and breeding flies, together with some parasites and predaceous insects from larvae found in cow-dung.

In July he wrote briefly of his observations, and especially mentioned the importance of Hister beetles and their larvae in devouring the larvae of flies that breed in dung, and also the scarcity of parasites, as compared with predaceous insects, at that season.

Before proceeding further it may be said that there are two methods of diminishing the numbers of dung-eating flies, (1) the

* Preliminary report furnished by Dr. Perkins at the request of the Board of Agriculture and Forestry.

direct method, by the introduction of parasites and predaceous enemies, (2) indirect, by the introduction of harmless dung-eating insects, which quickly remove the dung and so leave less food for the injurious flies to breed in. Somewhat intermediate between these classes is a third lot of harmless species, which, while they live in the dung, do not consume it or remove it rapidly enough to prevent the breeding of the obnoxious flies, but, at the same time, they perforate the cow droppings with passages in every direction, and allow the parasites of the flies to more readily approach and attack these. This class is already represented by several species here in the islands, and Mr. Koebele sent over larvae of a larger and more robust species, than any that we have here. At first I doubted the advisability of liberating these, not because they could possibly do any injury to vegetation, but because they will probably form part of the food supply of the voracious Histers, which may partly turn their attention to these, and therefore destroy a smaller percentage of fly maggots

Mr. Koebele's method of sending specimens, so far adopted, has been to place the living insects with food in glass tubes of various sizes; these tubes are wrapped in cotton and enclosed in tight-fitting cylindrical wooden boxes. They are thus forwarded by mail to Mr. Ehrhorn, the inspector at the port of San Francisco. Thence to the islands they are sent in cold storage. This method of sending has proven so satisfactory that nothing more need be desired. It is only possible during the cold part of the year, but that is all the better, as it will leave Mr. Koebele free to make his observations and gather material during the summer, to be forwarded here in the winter, which is the most favorable time for establishing the European insects. In all, I have received up to date thirty-nine vials from Mr. Koebele, containing sometimes a single insect in a vial, sometimes two or three, in the case of predators; in some have been sent numerous puparia of flies in the hope of breeding parasites.

Vial 1 contained some living larvae of a dung-beetle (*Aphodius*). Mr. Koebele was of opinion that this species was very desirable, but, partly owing to local conditions, which probably he had not in mind, and partly because the insect belongs to that intermediate class mentioned above, I should not place so high a value on its services, if established. It is likely to thrive best, and to be most useful in wetter districts or in drier ones at a considerable elevation above the sea level. From these larvae sent over, I later on had the satisfaction of breeding a small colony, which were sent to windward Hawaii, and liberated in a place, where further colonies could be easily obtained later, if they are successfully established, as they probably will be.

Vials 2-8 contained puparia of various dung-eating flies. From these I bred numerous species of a parasite, *Spalangia*, which I cannot separate from one already here, and which has been known here for at least thirty years. I am, however, making further ob-

servations on these, as I have received a nearly identical parasite from China, through our Assistant Entomologist, Mr. Terry, and a third also excessively similar is known to me from Mexico.

Vials 9-12 contained similar parasites.

Vials 13-15 contained predaceous beetles (Hister and Saprinus) hybernating, one in each tube. It is very important to introduce these and similar species, and, but for certain special local difficulties, this would be easy enough.

Vials 16-20 contained larvae of a beetle eating up the larvae and puparia of flies in dung. Mr. Koebele suggests that this will produce a Tenebrionid beetle and this is certainly correct, though the larvae, of which three arrived alive, have not yet matured.

Vials 20-24 puparia of flies likely to produce parasites.

Two species of parasites were bred from these belonging to the Alysiidae and the Ichneumonidae. Of the latter no pairing was obtained, but from the former, of which two females and one male emerged at intervals, a brood may be obtained. Both these and other allied parasites in numbers ought to be introduced here, especially as they not only destroy fly larvae in dung, but also those found in dead carcasses, from which, especially, are produced the flies that cause maggots in sheep. The chief hindrance to the establishing of these parasites would seem to me to be the general absence of such flowers on the ranches, as the mature insects visit for the purpose of feeding, and especially of those white-flowered umbelliferous plants, which are found in every field, hillside and pasture in Europe, and attract these parasites in extraordinary numbers.

Vial 25. Larva of *Philonthus,* considered by Mr. Koebele one of the best enemies for horn-fly. This vial, however, contained a larva of a Hister beetle on arrival, so that either an error was made, or the latter devoured the former in transit.

Vials 29-30. *Philonthus aeneus*, three or four mature speci- to devour the dung-beetles, as well as the injurious flies. These arrived dead, so the species could not be experimented with.

Vials 29-0. *Philonthus aeneus*, three or four mature specimens arrived in fine condition. As mentioned above (Vial 25) Mr. Koebele considers a number of species of this genus are wanted, being very important.

Vials 31-34. Contents mostly dead and of not much importance.

Vials 33-35. Three or four mature Hister breeds received alive recently.

During the coming summer I have suggested to Mr. Koebele that he should get together a lot of material of the above insects, most likely to be successful, and ship them, as soon as the cold weather sets in in America and Europe. He should then visit Northern Africa probably, and the more southern parts of Europe for other kinds of enemies of horn-fly. Certain local conditions here are of paramount importance and must be fully considered

in estimating the value of the natural enemies of dung-flies in Europe, and selection of these enemies must be made to suit these conditions or no success will be attained. This is a complicated subject and cannot be entered into in this report; in fact, my observations on the matter, though I have recently given much time to it, are still far from complete.

There has recently been a great deal of talk about the introduction of birds into the islands, and some by no means well advised suggestions have been made in this direction. If birds are to be introduced at all, I know of none more likely to be of great value than a common black and white Australian fly-catcher related to the little native "Elepaio." I referred to this bird in the Proceedings of the Hawaiian Entomological Society, Vol. 1, p. 10, as follows: "Another species (of fly-catcher) is commonly seen catching flies off the backs of cattle. It would be most valuable in these islands." An ornithologist (whose name I forget) connected, I think, with the Museum at Brisbane, informed me that it would be possible to introduce this bird. I myself had daily evidence of its great value.

With regard to Mr. Koebele's work, it will, no doubt, be necessary for this office to make a complete report, when that is possible, either for publication by this Station or by the Territorial Board of Agriculture and Forestry.

We are indebted to Mr. Edward M. Ehrhorn, Entomological Inspector of the State Board of Horticulture of California, at San Francisco, for receiving and forwarding to us the material sent by Mr. Koebele, and to Mr. Kotinsky for promptly delivering the same to us on the arrival of the steamers in Honolulu.

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## *SOME INFLUENCES THAT HAVE MADE THE PERUVIAN SUGAR WHAT IT IS.*

The existing condition of any great industry is the result of long years of development, and by looking over the general history of the country in which that industry has been developed, the influences that have made it what it is can usually be pointed out.

Hawaii's great sugar industry began to develop systematically as far back as 1850 when the members of the Royal Agricultural Society got together to experiment, with the object of finding out the industries that would prove most advantageous to the Islands. After a long series of trials the sugar industry proved to be the most satisfactory for the forty years to follow. During this time the people of Hawaii were living along peaceably and con-

tentedly, and the financier and agriculturists were permitted to give their undivided energies to the making of a great industry. Not so with Peru. She has had to contend with oppression and revolutions; and the periods of unsettled peace were not long enough to allow the financier and agriculturist to forget the past and to permit him to settle down to the systematic building of great enterprises. In order to understand why Peru's sugar industry is on the basis it is today it will be necessary to recall a few facts belonging to the history of this interesting and most fascinating country.

Tradition says that Peru was first settled about eleven hundred A. D., but it is quite probable that its soil was tilled by the hand of man long before this. The Incas and their people were a law-abiding and industrious people. The Inca was supreme and he ruled his subjects with a firm but kindly hand. All lands were the property of the government, and it saw to it that every household was allotted a piece of ground to till. Every member of the family had to devote part of his energies to the support of the family and Inca. Some of them grew corn, cotton and other crops, and others worked on the public roads and built temples and cities, or made themselves useful in one capacity or other. There were no idlers. There was no money and apparently no poverty. The Inca saw to it that all his subjects reaped the fruits of their labors.

[1] As living on the west coast of Peru was easy, but had to be worked for, and as there were few disastrous wars, a high state of civilization was reached. Their agriculture and arts were developed to the utmost, and the population increased so rapidly that provision had to constantly be made for its support by bringing new lands under cultivation. This they did by building irrigating ditches, some of them forty miles long, erecting dams and reservoirs to conserve the flood waters and making the mountain lands productive by an extensive system of terracing. Today, many of these gigantic works are in ruins; the result of conquest. It is not to be wondered at that the traveler views these ruins with a tingle of admiration for the past and a flush of shame for the present.

About 1530 Atahualpa, brother of the then reigning Inca, began to feel his own power, and he decided to rouse his followers to war against the government. The country seemed doomed. About this same time Francisco Pizarro, a bold, uneducated Spaniard landed in the City of Panama. Hearing of the little known people of the south who cared so little for gold that they used it in making balances, he decided to fit out an expedition,

[1] The greater part of the West Coast of Peru is dry, without vegetation and without rain. The valleys which cut the coast line are made extremely fertile and productive by turning the waters of the rivers that drain them on the otherwise unproductive soils. In order to do this it requires considerable careful and constant labor.

explore the country, and bring back all the gold and silver the Peruvians did not seem to have much need of. He was finally able to get a number of enthusiasts together like himself. As soon as arrangements could be made they set sail from Panama, and after a good many hard experiences landed in Peru in 1531. After a long hard march across country they arrived at the inland city of Carjamarca. There Pizarro found Atahualpa. Pizarro immediately espoused Atahualpa's cause (he probably thought that was the winning side). But the Spaniard found it to his own advantage to deceive Atahualpa and take him prisoner, which he did. Pizarro's brother, however, felt it his duty to get rid of the prisoner. Atahualpa was murdered and the conquest of Peru began. Cities and towns were laid in ruins, crops were destroyed and the great irrigation works of the Incas were demolished. When the country was finally under the control of Spain, Pizarro became its chief ruler. It was not long, however, before the conquerors began quarreling among themselves, and in 1541 Pizzaro was murdered by some of his own kin.

The long years of rule by the Viceroys that followed did not bring ease and comfort to the natives of Peru. Besides being forced to labor hard in the mines, subjected to all sorts of hardships in order to be civilized, they were at the mercy of the inquisition. When the inquisition was abolished in the middle of 1700 the descendants of the Incas felt themselves free, and from this time on they began to think and act for themselves. The descendants of the Spaniards born in Peru had lost many of the traits of either their forefathers or those Spaniards who had recently come from Spain. Foreigners came to Peru, married with both the native Peruvian and Spanish Peruvian. With this combination of influences a new nation was being made. They had heard of the struggle for independence in North America. They felt the influence of the days of '93 in France, and they longed to be free and to govern their country themselves. They had no leader, but fortunately in 1821 Can Martin, a foreigner to Peru, volunteered his services to lead them to freedom. Independence was declared in 1821, and after starting the little nation on the road of self government San Martin retired feeling that his mission had been accomplished.

The history of the new republic up to the last fourteen years has been a checkered one. The Peruvians, like the North Americans, had to learn by their own experiences, and it is not to be wondered at that political tranquility was not always the boon of the Peruvian people. Besides having to learn how to govern themselves, they had to deal with Spain again, and later in 1878, they entered into the disastrous war with their neighbor, Chili. This war made Peru a comparatively poor country. Her nitrate fields were lost and much of her agriculture and commerce was left to her to be made all over again.

After the close of this war about four years later the Peruvians

began to build the country up once more. They are still building, not only a country of industry, but a peaceable country. The cry in Peru today is peace and the privilege of developing her resources. From what was seen during a five years' residence there she seems to be doing both, and if allowed to continue will be one of the greatest nations of South America.

During these centuries of colonization and years of independence agricultural pursuits as well as other industries could not have had the attention paid to them that they might have if conditions had been otherwise.

The sugar industry was one of the first introduced into Peru. The first plantation was started about 1570 in the valley of Huanico. It is probable that the cane was brought from Jamaica or other islands of this group, as the cane chiefly grown at the present time goes by the name of Jamaica cane. The earliest relics of the industry that the writer has seen are two copper defedators dug up on a sugar estate a few years ago bearing the date of 1760. There is a little estate near Lima that is said to have produced cane for the past 150 years and perhaps longer. Today it is considered to have the best soils of any of the estates in that locality. The present owners are thinking about using fertilizers for the soils, but most of the fields are still yielding good crops without fertilizer, and it is claimed that the estate pays even at low prices, and that with an extracting plant which consists of a three roller mill.

About forty or fifty years ago renewed interest was taken in the sugar industry, Peruvian and foreign capital was invested in estates, up-to-date factories of the best workmanship were erected, and from an industrial point of view it was not surpassed by Hawaii or any other cane sugar country. Some of the machinery installed in those days can be seen in the mills now. On one estate there is a three roller mill bearing the date of 1868 which is still doing duty. This little estate is considered to be "a little family gold mine" and pays good dividends. The extracting plant consists of two three roller mills only, but in contrast to this the factory is equipped with a battery of most up-to-date Babcock & Wilcox boilers.

During these forty years the sugar industry had its periods of prosperity and depression. When sugar was 25 shillings a quintal the planters made plenty of money. Some of them went to Europe to spend it, leaving their estates to go on grinding without their supervision. Comparatively few labor-saving devices were introduced into the fields and the factories were not improved in accordance with the progress of the time. When sugar went down to 5 shillings their revenues ceased, and as there was very little provision made for the future many of the plantations became involved in debts that were hard to shake off. Besides this some of the estates suffered a great deal during the war with Chili, and in one instance at least a mill was blown up. This

plantation now produces about five thousand tons of sugar annually and is capable of producing forty thousand, which it might have been doing today if it had been allowed to develop unmolested.

For some time before the revolution in 1895 (which is the last of any consequence) and since, improvements have been going on in both factory and field. Unfortunately, in many instances no definite plan has been adhered to and a good deal of money has been spent without corresponding returns. This is particularly true with respect to improvements in the factories, and often enough money has been spent as would cover the expense to entire reconstruction on a modern basis.

[2] It is not within the scope of this article to go into details concerning the Peruvian sugar industry, and the object of including the following notes is merely to give some idea of its present status.

Most all conditions can be found in the factories and fields from antiquated machinery and methods to up-to-date appliances (in some departments) and modern methods.

The extracting plant is usually composed of two three roller mills, each mill being propelled by a separate engine; 32x66 and 32x72 rolls are the most common, although there are a number of 28x56 and 34x84 roll mills.

The boiling house is usually equipped with some type of juice heater. Defedation is carried on in open double-bottom copper defecators heated by live steam. The juice is clarified in clarifiers fitted with steam coils. The scums and deposits from the juice are put through a battery of filter presses. The clarified juice is evaporated in a triple effect under exhaust steam, and then boiled to grain in the vacuum pan which is fitted with both live and exhaust steam pipes. The massecuite is run into cooling cars, and after proper cooling and graining is centrifugaled in a battery of centrifugals of the Weston type. The sugar is carried to the drying room by elevator and is there spread out on the floor and dried. From there it runs through shoots to the floor below where it is bagged and stored or loaded directly on to cars. The first sugar polarizes from 96 to 98.3, depending on the demands of the market to which it goes. Large, medium and small grain are made, depending also on the market for which the sugar is intended.

The steam plants consist of all types of boilers from the old single flue to the most modern Babcock & Wilcox boilers. The furnaces are fitted with step-ladder grates for burning green bagasse. The bagasse is carried to the furnace doors by conductors

[2] For more detailed accounts of the industry the reader is referred to "Relating to the Sugar Industry in Peru" (in English and Spanish), and to the publications of the Peruvian Sugar Experiment Station (in Spanish). A good many extracts from them can be found translated in The International Sugar Journal and other publications.

and there fed by hand. A good deal of sun dried bagasse is still used. The factories are lighted by electricity.

The cane is cut, as it is universally cut, with the ordinary cane knife. It is then loaded on to cars that have been run into the field on portable tacks. The loaded cars are drawn up to the main line by oxen and from there hauled to the factory by locomotives. Most of the plantations are equipped with platform scales and weigh their cane. The cane is unloaded at the conductor by hand.

The Peruvian planters prepare their soils thoroughly before planting. If the land to be put in cane is new the brush is first cleared off. Then the field is plowed up with Fowler steam plows and carefully leveled off with scrapers. After it is perfectly clean and properly leveled it may be plowed two, three or four times, depending on the nature of the soil. The aim is to get the soil in a finely pulverized condition to the depth of 14 to 18 inches. The cane rows are laid off with a small plow drawn by oxen, and then opened with a double-mould-board plow. The rows are about four feet apart and four hundred feet long, and parallel.

The upper portion of the cane stalk is used for seed. The seed is planted wet, that is, just before putting the seed into the ground water is allowed to flow down the furrow, which gets the soil into a puddled condition. A few inches of the upper portion of the seed are left uncovered, allowing about a foot of it to be buried in the soil. It is put into the ground at a slight angle and with the eyes always pointing in the direction of the flow of the irrigation water.

Weeding is done by hand, and usually two or three weedings are given the plant cane.

Both the plant[3] and ratoon cane is hilled up. It is done by first breaking out the ridges between the rows with a Collins plow and then throwing the soil to the cane in the furrow with a double-mould-board plow, thus throwing the irrigating waters between the rows of cane.

Fertilizers are applied by hand. The Peruvian guano is the bulk of the fertilizer used, although bagasse, ashes, press cake, lime and potash salts are being more extensively employed than formerly.

The irrigation waters are almost entirely obtained from the rivers. The irrigation of the cane fields is easy as the country is usually gently sloping and the fields are thoroughly prepared for irrigation before planting.

While these brief notes give an idea of the appliances and

[3] On the plantations that are fertilizing their plant cane this custom of hilling up the plant cane should be abolished, as it is simply wasting plant food that the ratoon crop needs. This, of course, refers to normal conditions.

methods usually to be found on the most progressive estates there have been many improvements in particular cases, some of which deserve mention.

One or two factories are equipped with three three-roller mills fitted with hydraulic pressure apparatus, but driven by separate engines. Some factories are using quadruple effects and superheaters for juice, and centralized vacuum of the most up-to-date type. Sand filters, crystallization in movement, water driven centrifugals, automatic sack fillers and weigher and self-recording scales for weighing cane have been introduced. Strange to say there are no Demming apparatus to be seen in Peru. One factory has taken the initiative, however, in the introduction of the Kesner evaporator.

There are no modern standard cane unloaders in the country. Some plantations have attempted to make unloaders of their own design, but without satisfactory results. On some small estates where the 1.5 ton car is run up along side of the conductor, the cane is dumped bodily into the conductor, or the car put at such an angle that the cane will fall in gradually.

Some planters run the small 1.5 ton cars into the field to be loaded. From there they are drawn to the main track where the cane is transferred to large cars by steam cranes.

A good many devices have been tried in connection with cultivation. Some of them have proved to be failures and others have come to stay. An attempt was made to plow with a traction engine, but without very satisfactory results. Ditch diggers have been introduced with varying results. Some plantations are using discs on their plows in place of shears and claim fairly good results. Some employ markers on the double-mould-board plow which lays off the furrows, thus doing away with a man and team. A good many weeders have been tried without much success. In fact on many of the plantations there can be seen all sorts of modern agricultural implements which are used in other countries for other crops, that have been bought for trial in the cane fields and then discarded.

France, Germany, England, Scotland and the United States have sent all kinds of machinery and appliances to Peru. The factory machinery is of course the largest item, and today Scotland seems to have the strongest hold on this market. The English Fowler plows, of course, have few to compete with, and the American locomotive is taking the lead in transporting cane. The small agricultural implements that are now being tried come chiefly from the United States.

The development of the Peruvian sugar industry up to this point has been done by individual plantations. Up to within a few years the political and consequently social conditions of the country would not allow them to unite with the sole object of advancing the interests of the sugar business. A number of at-

tempts were made to bring the planters together but without any marked success.

The house of W. R. Grace & Co. of Lima, has been one of the foremost in aiding the systematic improvement and development of Peru's sugar industry. Their efforts deserve mention here.

In 1903 this house arranged to have the writer make a preliminary trip to Peru. On his arrival there, an effort was made to bring some of the largest planters together to organize a central office for investigations, but all attempts in this direction failed. Grace & Co. then decided to establish a technical office of their own for the estate they represented. So far as can be learned they were among the first either in Peru or elsewhere to organize a work of this kind on such a liberal and comprehensive basis. The Peruvian Government now fully appreciating the necessity of harboring the interests of its greatest agricultural industry, decided to maintain a consulting office and experiment station exclusively for the benefit of the sugar planters. The organization of this station was begun by the author in 1906.

It would have been commendable in any government to have inaugurated a work of this kind, and it should be gratifying to Peru to know that she took the initiative among the Latin American countries in this work.[1]

The experiment station has had and is still having considerable influence on the development of the Peruvian sugar industry, and a few words concerning it will not be out of place.

Its aim was to keep in touch with everything pertaining to the industry, from the analysis of soils and materials used in the business to the class of sugar a particular market demanded.

Experimental fields were laid out where all kinds of planting, fertilizing, irrigating tests were made. A laboratory was established where original investigations were carried out; and soils, fertilizers, sugar house products and many other materials employed in the industry were examined, such as lubricating oils, building materials, boiler feed, waters, etc. A portable laboratory was fitted up which was carried around to plantations that had no laboratory or chemist, and the work done for them by the Station staff. Chemists were broken in for plantations, and assisted in establishing field and factory control on the estates where they were employed. Experiments were started on some of the plantations, an effort was made to have the weather observations recorded in each valley, and on as many individual estates as possible. A system of keeping statistics gotten up by the station was adopted by some planters.

[1] Argentina has employed Dr. Blouin to make investigations for the planters there. Judging from a note found in the Hacendado Mexicano Mexico is feeling the necessity of such an institution as a sugar experiment station. In speaking of the work of the Peruvian Station the Hacendado Mexicano says: "We need a similar institution in this country, a thing we have been asking for for a number of years."

The plantations were visited once or twice a year with the object of consulting with the managers on questions relating to field and factory. During these visits notes were taken of the methods and machinery employed by each estate, and when there was any change in methods or new appliances introduced they were recorded.

A consulting office was opened in a convenient place in Lima where certain hours during the day were set aside for giving advice and data to all who might be interested in the sugar industry, and who cared to take the trouble to call.

The Station issued bulletins and reports which were sent to all the plantations. Public lectures were given under its direction. Circular letters replying to questions asked by some of the planters were sent out.

An effort was made to introduce uniform methods for guano sampling and analysis. The Station took some part in the movement in France for the establishment of uniform methods of sugar analysis. It brought the planters together with the object of forming a well organized planters association.

As time went on it was planned to have a department of entomology and vegetable pathology. It was also the aim of the Station to employ a man of mechanical ability and inventive genius to study and work on labor saving devices and to study other mechanical problems.

Efforts were made to have an up-to-date factory (in model) set up in the Machinery Exhibition Hall in Lima, so that the planters visiting the city could have an opportunity of learning for themselves what the latest improvements were in factory construction.

The labor problem in Peru, as in all countries, is an important factor in the development of the sugar industry. Peru, however, is better off in this respect than many other countries because the natives have shown a disposition to work. At present they are well treated and receive a fair wage for their service. The plantations support schools and hospitals for them, and their interests are looked out for as far as conditions will permit. There is a closer relation and better understanding between the planter and laborer than could exist if the laborer were foreign to the country.

Forty or fifty years ago a good many Chinese were introduced to work on the plantations. At the present time Chinese laborers are excluded from the country. Of late years a good many Japanese have been taken to Peru as laborers. Some plantations have had good results with them, while others have had very unsatisfactory results.

There are a few coolies, negroes and other nationalities working on the estates, but the majority of the laborers are the natives of the country. For their own sake it is hoped that they will continue to evince a desire to work in both field and factory.

The Peruvian sugar industry will be much influenced by the

future supply of guano. Up to the present, guano containing 8 and 9 per cent. nitrogen and about the same amount of phosphoric acid could be purchased for about ten dollars per ton. If the supply is exhausted the planters will have to either give up fertilizing or use expensive prepared fertilizers. In either case they will lose some money. The Government employed an expert to report on the guano question and to make recommendations for the augmentation and conservation of the guano supply. It has become of national interest and may figure in the future politics of the country.

Peru sends sugar to a number of markets. Liverpool takes about sixty thousand tons, Chili about forty thousand and the rest is distributed between New York, San Francisco, Japan and Australia. It is generally sold aboard in the Peruvian ports, and the prices are governed by Liverpool quotations. Some markets buy on polarization and general appearance while others demand the rendiment.

The Government protects the planter by a heavy tax on sugar. Agricultural machinery enters free of duty. There is, however, a heavy domestic tax on white sugar made and consumed in the country.

The foreigner finds Peru a good country to do business in as there is no paper money, and the Peruvian pound (gold) and the English pass in the country at the same face value. Only a limited amount of silver (in coin) is allowed to be taken into Peru.

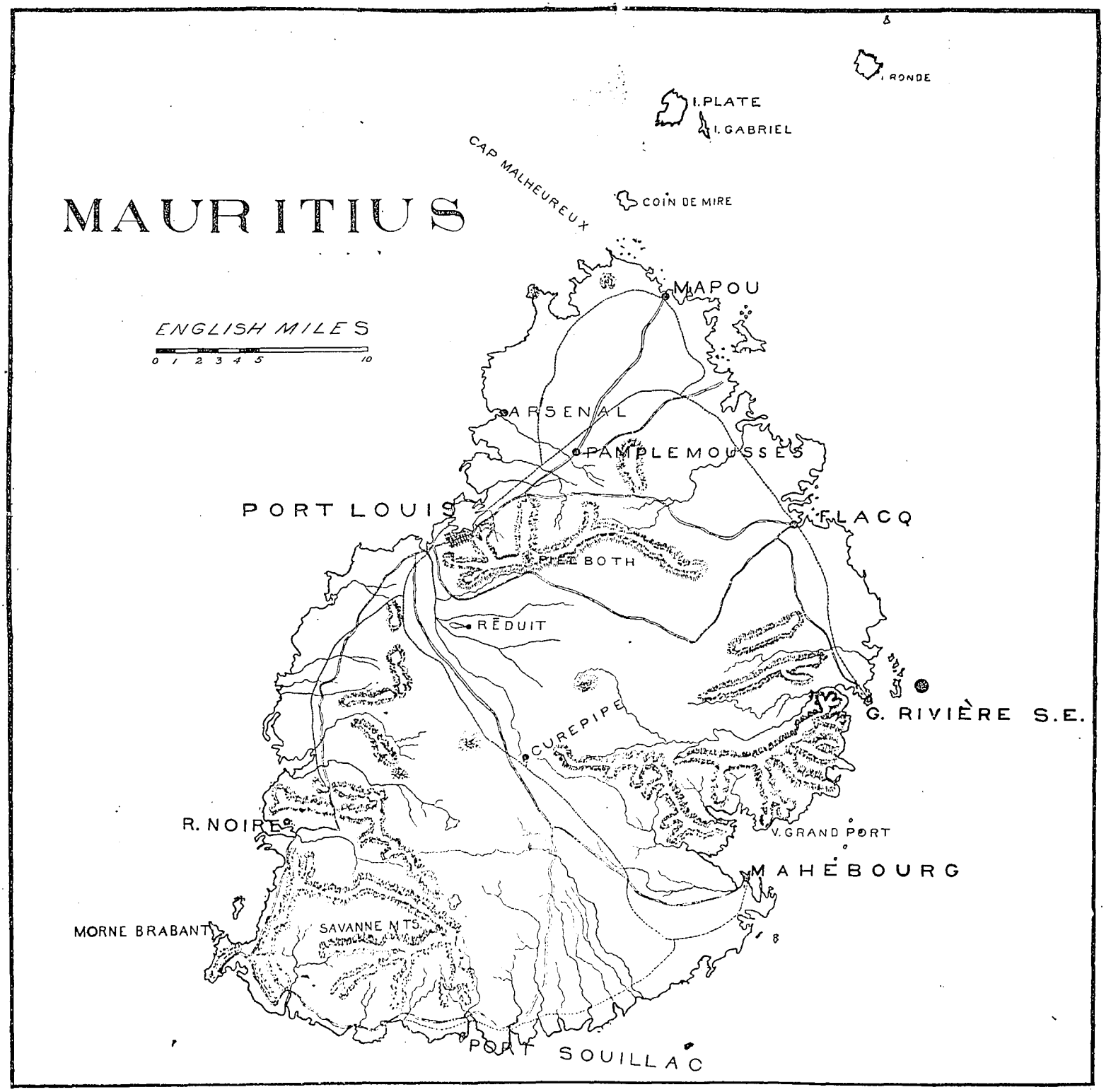
The opening of the Panama canal is expected to have a marked influence in the development of the country, and consequently the sugar industry.

The writer has estimated that the west coast of Peru is capable of raising its present annual output of about 150,000 tons to 300,000 of sugar and secondary products.

The most urgent needs in the development of the sugar industry today are: Rearrangement of the factories, introduction of modern crushing plants and labor saving devices, protection of the guano birds and animals, the increase in the water supply in some sections, and, (for greater extension), to bring some of the old Inca lands under cultivation by extensive irrigation works.

The west coast of Peru is destined to be one of the most profitable sugar growing districts of the world. It only needs capital and systematic development.

T. F. Sedgwick.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R. NOIRE
V. GRAND PORT
MAHÉBOURG
MORNE BRABANT
SAVANNE MTS.
PORT SOUILLAC

## *THE ISLAND OF MAURITIUS.*

The Island of Mauritius has a peculiar interest for citizens of Hawaii, for many reasons, being a tropical island, with a climate similar to ours, being dependent, like Hawaii, on a single industry, the production of sugar, and dealing with economic, political and racial problems, which are interesting to us, both from their agreements and their contrasts with the conditions existing here.

A charming picture of the primeval beauty of that island has been drawn by Barnardin de St. Pierre, in his famous idyll of "Paul and Virgina." In later times it has been noted as one of the foremost sugar producing countries of the world.

### SITUATION.

It lies in the Indian Ocean, 500 miles east of Magagascar, 115 miles northeast of the Isle of Bourbon, and 2,300 miles from the Cape of Good Hope, between 19° 58′ and 20° 32′ south latitude, and between 57° 18′ and 57° 49′ east longitude. It is therefore just as far south of the Equator as Hawaii is north of it. As it contains the only good harbor between Cape Colony and India, it occupies an important strategic and commercial position in the Indian Ocean. The area of the island is 705 square miles or 432,689 acres, being a little less than that of Maui.

### PHYSICAL GEOGRAPHY.

Like its sister island of Bourbon, it is of volcanic origin, rising from a great depth to a considerable elevation above the sea. A central plateau is partly encircled by basaltic mountains, the highest peak of which is 2,730 feet in height. The whole island has evidently been upheaved at a recent geological period. It is surrounded by fringing coral reefs and islets, broken by channels here and there, where streams flow into the sea. The numerous streams are small, and many of them cease to flow in the dry season.

### FLORA AND FAUNA.

When first discovered, the island had a very rich and peculiar flora and fauna of its own, differing not only from those of Africa and Asia, but even from those of Madagascar and the neighboring islands. There were then numerous gigantic, wingless, ground pigeons, called Dodos, and other remarkable birds, which were all exterminated by the first settlers. The large land tortoises, once so numerous that they "paved" the beach, met the same fate. Snakes are still unknown, although scorpions and centipedes of the worst kind abound.

### DEFORESTATION.

The magnificent forests, matted together with climbing vines, as described by St. Pierre, have almost entirely disappeared, with the usual disastrous results. As Mr. J. F. Anderson stated in a paper read before the Royal Colonial Institute, Dec. 18th, 1896: "It is not difficult to explain the long droughts which at times fill our hearts with despair, when we find our beautiful forests completely depleted to make room for cane, a criminal act, which has caused untold injury to the salubrity of the island, and has been the cause of the ruin of many an estate. * * * The only effectual remedy," he says, "is for the Government to buy up all the lands surrounding the sources of the streams, that supply water to the low lands, and *rewood* them with good and hardy forest trees."

### THE FOREST DEPARTMENT.

Since the above was written, a Forest Department has been established, which has under its care 84,000 acres of Crown lands and mountain and river reservoirs. The Royal Botanical Gardens at Pamplemousses, including an extent of 91 acres, were founded in 1768 by Mr. Poivre, who introduced the clove, nutmeg, and a great variety of useful and ornamental trees. These gardens have been replenished from time to time from the botanical gardens of Europe, Cape Town, India and Australia, and now form the chief attraction of the island. There are also extensive Government nurseries.

### CLIMATE.

The climate of Mauritius is somewhat warmer and more moist than that of Hawaii. The mean temperature at Port Louis, the capital, is 77° F., while on the plateau it is only 74° 5′ F. The extremes are 90° and 52° F. The average humidity is 75 per cent., the extremes being 97.8 and 40.7 per cent. The island has a hot and wet season from November to May, and a comparatively cool and dry season from May to October. The rainfall is very unequal in different parts of the island, and in different years. The wettest station in Cluny is the southeast, with a mean annual rainfall of 145 inches; the driest is Albion on the west coast with a mean annual rainfall of 31 inches.

### HURRICANES.

The prevailing winds are the southeast trades, but from December to April the island is liable to be visited by terrific cyclones or hurricanes, which sweep over the Indian Ocean from northeast to southwest past the islands of Bourbon or Reunion and Mauri-

tius. During a period of 25 years there were 53 cyclones, of which 30 occurred in February and March. This is one of the greatest perils that hang over the head of the Mauritian sugar planter. Mr. J. F. Anderson describes one of them as follows: "On the 29th of April, 1892, thousands of acres of luxuriant cane fields were uprooted in every direction, nine-tenths of the sugar factories unroofed and seriously damaged, and all the 'camps' razed to the ground within an hour and a half by a terrific cyclone. Not less than 12,000 people were killed, 2,000 being killed or injured in the city of Port Louis." The sugar crop for that year was reduced from 124,000 to 94,000 tons, and the following year reached only 87,000 tons. "Every planter," he says, "passes through very anxious times from October to May. As he wakes up in the morning, his eyes scan the barometer, an indispensable article of furniture in a Mauritian home, he refers to it again at noon, and at night before he retires, he consults his weather glass once more."

### HEALTH.

Mauritius cannot be said to be a healthy place of residence, and has been repeatedly visited by dreadful epidemics of cholera, fever, etc., but these are owing not so much to natural causes as to the folly and neglect of man. The climate near the coast is no doubt debilitating, and in some places malarious, but on the uplands in the interior it is cool and healthy.

### HISTORICAL SKETCH.

The two islands, Mauritius and Bourbon or Reunion, were discovered by a Portuguese navigator in 1505. They were then uninhabited except by Dodos and other strange birds, turtles, etc. The Portuguese kept their discovery secret, and contented themselves with landing a colony of deer, goats, pigs and monkeys. In 1598 the island was rediscovered and taken possession of by a Dutch fleet under Admiral Warwick, who named it Mauritius after Count Maurice, who was then the Stadtholder of Holland. In 1644 the Dutch formed a small settlement on the southeast side of the island. To supply laborers, they brought over a shipload of kidnapped natives of Madagascar, who soon escaped to the forest. Their descendants, called Maroons, reinforced from time to time by runaway slaves, made constant war on the whites for about a century.

At length, in 1712, the Dutch East India Company abandoned the island, removing their colonies to the Cape of Good Hope.

### MAURITIUS UNDER FRENCH RULE.

In 1715 the French Governor of Bourbon sent Capt. Dufresne,

with his ship the "Chasseur," to take formal possession of Mauritius and gave it the name of the "Isle of France," which it retained until 1810. The first French settlement was made in 1722, most of the settlers being natives of Normandy and Brittany. The real founder of the colony was Governor Mahé De Labourdonnais, who was sent out by the French East India Company in 1734. He saw the value of the fine harbor on the northwest, called Port Louis, and made it the seat of government. He built forts, arsenals, hospitals, wharves, wet and dry docks and aqueducts, laid out roads around the island, and started shipbuilding. He introduced the culture of the sugar cane, which has ever since been the main resource of the colony. To guard against famine, he introduced the manioc or cássava plant from Brazil which became the principal article of food for the negroes. He also endeavored, without much success, to mitigate the cruelty with which the slaves were treated.

### SLAVERY.

The slave trade was carried on at first by a gang of pirates, who had settled on the islet of Ste. Marie, off the northeast coast of Madagascar, and afterwards by European traders of equally bad character. The slaves were brought partly from Madagascar and partly from Mozambique on the African coast. Such were the horrors of the voyage that only half of the negroes embarked were found fit for service in Mauritus. It is said that "out of every eighteen slaves in the colony one died annually, so that if the traffic had ceased for eighteen years, at the end of that time the whole black population would have died out." According to the testimony of writers who visited or lived in the colony during the eighteenth century, such as St. Pierre, Sonnerat and Baron Grant, the treatment of the slaves was atrocious. The African coast was comparatively near, and the supply of slaves inexhaustible. Hence, as Rev. P. Beaton remarks: "The great problem was to extract from them the maximum of labor, and to feed them at the minimum of cost." "The Code Noir," he says, "which was intended to repress cruelty, is itself one of the darkest records of human cruelty in existence." And yet during the existence of slavery the planters continued to be poor, and the colony, instead of paying its own expenses, cost France eight million francs a year. During the long wars waged between France and Great Britain for the possession of India, the French had a great advantage, as Admiral Mahan points out, in holding this strongly fortified naval station, midway between the Cape of Good Hope and India.

### MAURITIUS DURING THE FRENCH REVOLUTION.

When the news of the outbreak of the French Revolution ar-

rived in 1791, it was received with great enthusiasm. The tricolor was everywhere adopted, a Jacobin Club formed, and a guillotine erected in the public square of Port Louis, but fortunately it was never used. When a decree arrived from the National Convention, summarily abolishing slavery in all the colonies of France, without compensation, a violent revulsion of feeling took place. In a community of 59,000 persons, of whom 49,000 were slaves, the alarm excited by such a decree may well be imagined.

A counter revolution followed, the Jacobin Club was annihilated; the guillotine was demolished, and thirty of the leading Jacobins were deported to France. Two delegates from the French Directory, who arrived on a frigate, and claimed dictatorial powers, threatening to guillotine the Governor, were deported, narrowly escaping with their lives.

In 1802, Napoleon annulled the ordinance abolishing slavery and slave trade in the French colonies, to the joy of the Mauritians, and sent General Decaen to the colony, with despotic powers.

### AFTER THE CONQUEST BY GREAT BRITAIN.

In November, 1810, after several bloody conflicts by sea and land, (which we have not time to describe), both the Isle of Bourbon (afterwards called Reunion) and the Isle of France were conquered by the British forces, and the ancient name of Mauritius restored to the latter. The British Government from the first treated the French settlers with great liberality. They were promised the continuance of their system of law, founded on the Code Napoleon, their language and their religion, and these promises have been kept. The Roman Catholic Church is liberally supported by the Government. French or a corrupt patois of French, called Creole-French, is still the language generally spoken, though English is taught in the schools, and is the official language. The slave trade was prohibited in 1813, but this law was not executed, public opinion being strongly against it, and the local authorities connived at its violation. The only convictions vere obtained for violations of it were in the case of certain offenders who had been sent to England for trial.

In June, 1825, an act was passed by the British Parliament, admitting the free importation of the products of the colony into British markets. Their case was similar to that of the Philippines in relation to the United States. The immediate result was an extravagant "boom." There followed a period of wild speculation and extravagance. Landed estates rose to triple their value, and vast sums were drawn from England and India for investment. A severe reaction followed with its usual ruinous consequences.

## EMANCIPATION.

The proposal to emancipate the slaves met with violent opposition. It was deemed necessary in 1833 to disarm all persons in the colony, and to bring in a force of regular troops. On the 20th of August, 1833, an act passed the British Parliament, emancipating all slaves in the Empire, and appropriating twenty million pounds to compensate their former owners. This act went into force in Mauritius on February 1st, 1835, from which date all registered slaves became "apprentices" for four years. The total compensation paid to the slaveholders amounted to £2,112,-632 and 10/, or $10,267,394 for 68,613 slaves, making an average of about $150.00 apiece. At the lowest estimate, at least 10,000 of these slaves had been illegally imported since the prohibition of the slave trade. The transaction was admired in Mauritius as a master stroke of "graft." The large sums thus obtained were to a great extent squandered in luxury and dissipation, and led to the financial ruin of many of the white Creoles.

On Feb. 1st, 1839, the "apprentice" system came to an end, and the ex-slaves, having been worse treated than those in the West Indies, generally refused to work, and disturbances took place all over the island.

## COOLIE EMIGRATION.

This state of affairs had been foreseen by the planters, who now had recourse to the Hill Coolies of India. This immigration was and still is strictly controlled and regulated by the British Government. It is considered simply the moving of British subjects from one part of the Empire to another where their condition and prospects will be greatly improved, and is safeguarded in every possible way. On arriving in the colony, they are indentured for three years, under the supervision of an agent-general or protector of immigrants, are guaranteed a fixed rate of wages, regular rations, decent lodging, free medical attendance, and a free passage home after the expiration of their term of service. Their condition and treatment on the plantations are frequently inspected, and quarterly reports on the same made to the Government. Their wages in 1860 were at the rate of seven rupees per month, with 50 pounds of rice, 4 pounds of dholl, a kind of pulse, 4 pounds of salt fish and one pound of salt as rations. On re-engaging after their first term of service has expired, their wages are increased, often 50 per cent.

Before the Emancipation Act took effect, no less than 24,566 coolies had arrived from India. During the next thirty years, the Indian population increased rapidly, until in 1870 it amounted to two-thirds of the whole population. Since 1880 its increase has been very gradual, the departure being in some years greater than the arrivals. Mr. Anderson states that "three-fourths of the

coolies renew their contracts, and after a term of years become small landed proprietors or lessees, raising crops on shares."

Although much inferior to the Japanese or Chinese, they are superior to the Creoles in industry, thrift and self-reliance. As the Governor's report for 1901 states: "Large portions of sugar estates, and even whole estates have been sold to the Indians, who are cultivating sugar as peasant proprietors." Again he says: "This tendency to 'morcellement' (i. e., subdivision), or towards an Indian peasant proprietorship, is further illustrated by the fact that while in 1869 there were 223 estates, and in 1881 there were 171, in 1891 the number had been reduced to 131, while in 1901 there were only 115." We find that in the year 1906 lands worth 1,181,196 rupees or $382,707.50, were purchased by Indians.

It appears that a large proportion of the estates are encumbered with debts.

### DECADENCE OF THE CREOLES.

The former superintendent of Schools says of the colored Creole: "While at work and in receipt of good wages, he is improvident and a spendthrift; out of work a helpless pauper." The Governor's report for 1901 contains the following passage: "Poverty and pauperism are on the increase in Mauritius; especially among the Creole population. The habits of dependency engendered by the family system, and by the paternal and socialistic system which has so largely crept into the administration, tend to weaken the habit of self-help and self reliance of the Creole population. Unfortunately the Creole population has learned to look to the Government in all times of colonial, family or personal misfortune or distress. Individualism has been destroyed by state interference and state aid, with results that are likely to be calamitous to the race. The Indian population is slowly but surely pushing the Creole population to the wall, and with their habits of industry and self reliance, they must ultimately prevail." The same report shows that outdoor relief in 1901 was extended to 78,013 persons.

### VITAL STATISTICS.

The vital statistics given in the census reports are very unsatisfactory. No attempt is made to classify the population by race as is done here, but it is divided into two great classes, viz: the general population and the Indian population. The total population in 1906, excluding the military, amounted to 375,400, of which the Indian numbered 262,572, showing an increase of 3,486 over the census of 1901. The density of population is 536 to the square mile. The density of population on Oahu is 97 5/6 per square mile. Mauritius is evidently overcrowded.

According to recent observers, the process of miscegenation has advanced so far that not a full-blooded negro is to be found, but

there are all shades of color, mulatto, quadroon, octoroon, etc., all lumped with the native French inhabitants under the general head of "Creoles." According to Prof. Keller, the color line is still strictly drawn in white Creole society. He describes the mixed race as being ambitious, vain, excessively fond of display, and lax in their morals.

In an article by Hon. J. W. Fortescue, published in the National Review in 1892, he states that the population of Mauritius in 1883 "numbered 359,873, of whom 249,000 were Indian immigrants or their descendants, the balance being made up of an extraordinary conglomeration of races, French, English, African descendants of the old slaves, Chinese, Arab and Malagasy. Of these last, the French numbering 2,370, and the Malagasies, numbering 1,250, are respectively the most and the least important elements." He goes on to state that "the white French population, according to the figures in the blue books, diminished from 8,000 in 1831 to 2,370 in 1881, while the colored population increased."

While the planters in the interior, leading an active, outdoor life, are a sturdy, hospitable class, extremely fond of field sports, the white inhabitants of Port Louis have degenerated both physically and morally, although they are still bright mentally. U. S. Consul Pike says that they "beat Yankees out and out in talk," but that there their activity ends.

Another writer in the International Sugar Journal, says on the French Creoles: "They have greatly degenerated, being little recruited by new blood, and breeding in and in for the last hundred years." * * * "The active and alert Frenchman has become ignorant, lazy, corrupt and boastful." Again he says: "The race also suffers not merely from inbreeding, but also from the general neglect of sanitary precautions; the physique is low and soaked with malaria. The women take very little exercise, and age rapidly."

### HEALTH CONDITIONS.

In regard to health conditions, the statistics present a sad picture. The birth rate has decreased in five years from 34.6 per 1,000 in 1901 to 33.5 in 1906, which is, however, higher than it is in most European countries. On the other hand, the death rate hadbeen steadily rising during the past nine years from 29.5 in 1897 to 40 in 1906. For the same period in England and Wales it fell from 17.4 to 15.4 per 1,000. In France the average is 20 per 1,000. The following is the death rate of three cities during 1901, viz: Calcutta, 33.6; Cairo, 35.4; Port Louis, 85.7. This last is frightful, amounting to one in twelve, and shows the effect of the utter neglect of all sanitary precautions. Here is a city of 70,000 inhabitants, a large majority of whom are a low class of mulattoes and Asiatics, which had open drains until recently, and even now is without sewers, to the best of my information.

Sanitary reforms have been talked about for fifty years, and in 1869 a survey of the city and a report on its drainage was made by Mr. Bazalgette, an eminent engineer, but nothing came of it. Even in the country districts, the sanitary arrangements are primitive in the extreme, and it is no wonder that cholera and fevers have become almost endemic.

In 1854, there was a terrible epidemic of cholera, probably introduced by coolies from Calcutta, which carried off 7,650 persons. In 1856 a low fever, commonly called the Bombay fever, was introduced, which was fatal to many of the laborers. In 1866 this same fever carried off 10,000 people in Port Louis during the month of April alone, and before it ceased it had swept away 30,000 inhabitants of the colony.

### FORM OF GOVERNMENT.

The form of government for many years was that of a Crown Colony of severe type, being vested in a Governor, assisted by a Legislative Council, composed of seven official and as many unofficial members, all appointed by the Crown. It was not considered safe at the time of the conquest to intrust the ex-slaveholders with power over the large colored and Indian population. The first attempt at elective institutions was made in 1850 by the erection of Port Louis into a municipality, which, however, has fallen into deserved contempt.

In 1882 friction arose between the official and unofficial members of the Governor's Council. An agitation was then started for a change in the constitution by which part, at least, of the Council should be elected, meetings of the leading French Creoles were held, and committees appointed to draw up a scheme for representation. They proposed to restrict the right of suffrage by a property qualification and the further requirement of ability to write in either English or French. This latter condition was intended to exclude the Indian element, but was promptly stricken out by Lord Derby, then Secretary of State for the Colonies. Indeed, he rejected the whole scheme at first, on the ground that it would give the government of the colony, first into the hands of a small oligarchy of planters, journalists and lawyers, and later on put the electoral power into the hands of the Indian and colored population, a class, as he said, "easily preyed on by demagogues."

Afterwards there was a change of governors. Mr. Napier Broome was promoted to the government of an Australian colony, and Sir John Pope Hennessy took his place. Sir John warmly supported the cause of the reformers, and Lord Derby with his usual vacillating policy, consented to meet them half-way, although he still adhered to the opinion that Mauritius was well enough off under the old constitution. The change was finally carried out in 1885. Since then the government has been administered by a Governor, aided by an Executive Council of five

official and two elected members, and a Legislative Council of eight *ex-officio,* nine appointed and ten elected members. Instead of universal suffrage, which was imposed on the French colonies of Guadeloupe and Martinique by Gambetta in 1871, there is here a rather high property qualification, so that according to Prof, Reinsch, out of a population of 375,000 inhabitants there are only 3,000 voters. As in certain other colonies, the control of the patronage and the multiplication of officials is their chief concern, while expenses for public improvements are kept down. The civil service is overmanned and very corrupt. These tendencies, however, can be checked in a great measure by an able Governor. The conclusion arrived at by Mr. Fortescue is as follows: "That in countries of small area where white and colored races live together, there is no safe medium between Crown Colony government and the fullest development of the representative principle."

"The first," he says, "means the supremacy of the whites, order, peace and prosperity. The second means the supremacy of the colored race, and what further we do not pretend to say." He then refers to the failure of universal suffrage in Martinique and Guadeloupe, and to the experience of Jamaica, and quotes the French publicist, M. P. Leroy-Beaulieu, who considers universal suffrage in the French colonies as an "absurd institution."

Contrary to expectation, the large Indian element in Mauritius has so far taken very little interest in politics, and is practically unrepresented in the Legislature, while the Creoles are active politicians.

The writer in the International Sugar Journal, quoted above, says: "In short, the people are unfit for self-government—the Creoles, for the reasons already given, the Indians from their oriental race and breeding, and the government most suitable under the circumstances, is a firm, honest and benevolent despotism."

Prof. A. L. Lowell in his great work on the Government of England, (Vol. II, p. 416), commenting on the Maltese constitution of 1887, says that " a legislature elected by the people, coupled with a governor appointed by a distant power, is a contrivance for fomenting dissensions and making them perpetual." * * * "A colony can be governed by its own people, or it can be governed by the mother country, but under ordinary conditions it cannot be governed successfully by a combination of the two."

I will add here a few figures. In 1906 the total revenues of the colony amounted to $3,619,000 ,and the public expenditures to $3,212,722. The public debt has risen to $6,410,340.

The total exports were valued at $13,334,540, and the imports at $9,586,530. All the official accounts are kept in rupees, the present value of the rupee being one-fifteenth of a pound, or 32.4 cents.

It may be noted here that all the railways belong to the state, having been built by English engineers and contractors.

NOTES OF SUGAR CULTURE.

Like Hawaii nei, Mauritius is what the French call a *"monoculture* country," its sole dependence being sugar. Coffee was once raised there, but the terrible Ceylon fungus (Hemeleia vastatrix) found its way thither, and its cultivation was given up.

Sugar cane was introduced into Mauritius from Java in 1747 by Governor Labourdonnais, and the first sugar factory was built in 1750.

The soil is very fertile, but so stony that in some parts walls from two to four feet high are built between the rows of cane. The planting is done from December to March. The plough is not used, but holes are dug about 20 inches apart, a foot deep and 18 inches long, in which the cuttings are laid. Generally a quantity of manure or guano is placed in each hole, and covered with a thin layer of earth before the cane is planted. Nearly £130,000 are spent annually for guano. There is very little if any irrigation. The more intelligent planters practice rotation of crops, letting the ground lie fallow after two years' cultivation, or planting it with various kinds of pease or manioc root.

The canes ripen in from 12 to 15 months. The grinding season or "coupe" begins in September or October. The "Borer," (well named Xyleborus perforans), was first observed in 1848, having been introduced from Ceylon, and is a terrible pest. As in the West Indies, a widespread disease is caused by a fungus, (Trichospheria), and also by an Acarus, a microscopic insect, chiefly found under the leaves, commonly known as *"rust."*

The manufacture of sugar from the cane is carried on very much as in Hawaii nei. In fact, Mauritius formerly led the way in the application of improved methods in this industry. The vacuum pan was introduced there as early as 1844, and the turbine or centrifugal in 1852. The present day "usine" or sugar mill prides itself on producing from 25,000 to 30,000 pounds of sugar per day. The diffusion process, successful in Egypt, did not pay in Mauritius, from the cost of fuel and labor and insufficient supply of cane. It was tried on two plantations, but they discarded it and went back to the use of rollers. Bagasse is used for fuel, but firewood is also generally added to start the "usine." The molasses is sold to distillers for the manufacture of rum.

In general, an acre of cane yields about two and a half tons of sugar, which has to bring at least eight rupees or $2.59 per hundredweight in order to meet expenses. From 1886 to 1896 the amount of sugar exported averaged 130,000 tons per annum, which is about equal to the amount produced on the Island of Oahu. Since then the production of sugar has greatly increased, reaching 205,000 tons in 1906.

The greater part of the sugar is exported to India, the rest chiefly to Cape Colony and Great Britain.

I have not been able to ascertain the number of acres under cultivation, but should judge it to be not less than 150,000 (including the land lying fallow), or over a third of the island.

W. D. ALEXANDER.

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## *THE RELATION OF FORESTS TO THE SUGAR INDUSTRY OF HAWAII.*

By R. S. HOSMER, Territorial Forester.

One of the noteworthy features about the economic situation in Hawaii is the intimate relation that the forests bear to the main industry of the Territory, the production of sugar cane. Hawaii is essentially an agricultural country, dependent on irrigation. Over half of the fifty odd sugar plantations could not be carried on successfully without it and of the rest many use large quantities of water annually for fluming cane, for power development and for other economic uses. To bring water out from the moist windward districts and distribute it for use, over fifteen million dollars have been expended, wholly by private enterprise, in the construction of ditches, flumes, tunnels and the other necessary units of an irrigation system.

It follows naturally that where the demand for water is so great, care should be taken to protect the sources of supply and do what is possible toward equalizing the flow of the important streams and storing the storm water for future use. Because a forest cover on the watersheds and catchment basins helps in just this way, the protection of the forest plays an important part in the successful development and continued prosperity of the main industry of the Territory. Throughout Hawaii are large areas potentially rich in soil but semi-arid in character. Only by the application of water can such lands be made productive. Much of this area is now in sugar but whatever the crop, irrigation is a necessity.

The primary value of the Hawaiian forests is that they help to put these lands to use. The native Hawaiian forest is admirably adapted for the conservation of water. Consisting as it does of a dense jungle of trees, high growing shrubs, tree ferns and climbers, with much undergrowth and a heavy ground-cover of ferns and mosses, the forest effectually prevents erosion and serves as a reservoir to hold back a large percentage of the rainfall, giving out the water gradually to the springs and streams that rise within its boundaries. This is the more important in Hawaii because here in the Islands the catchment basins are small and the valleys of the streams short and steep.

In practically all the districts where there is permanently running water, the chief value of the forest rests in the protection it affords the streams that are now, or later may be turned to economic account. Because of the large part that it has to play in the development of the Territory, water is the most important product of this class of forest and consequently the forest should be so managed as to yield the largest quantities of water for the longest time. As the Hawaiian forest is easily destroyed when subjected to injuries by men or cattle, it has been found, in sections where the forest is needed for water protection, that the forest cover should be maintained strictly intact.

In order permanently to protect the forest in an efficient way forest reserves have been created under the direction of the Territorial Government. At the present time sixteen forest reserves have been set apart by proclamation of the Governor of the Territory, with a total area of 444,116 acres, of which 61 per cent., or 273,912 acres, is government land. The remainder is owned by private interests, for the most part sugar plantation companies. The primary object in the creation of all but one of the forest reserves so far established is the protection of the important watersheds from which water is diverted for economic use. The forest reserves are therefore the direct outcome of a commercial need. They are made because to keep such land under a forest cover is to make it of greater use to man than it could be in any other way.

Recent estimates of the area of forest land in Hawaii show that the Koa and Ohia forest type—in which are all the forest reserves —covers approximately 1,175,000 acres. Of this area it is probable that in time about 750,000 acres will be included within forest reserve boundaries.

The forest work of the Territory is carried on by the Division of Forestry of the Territorial Board of Agriculture and Forestry. The present organization and the inauguration of a definite forest reserve policy date back a little under six years, but prior to that time not a little forest work had been done both by the Hawaiian Government itself, in the way of tree planting, and by individuals and corporations in forest planting and in the setting apart of private forest reserves. One of the notable things about Hawaii is the strong public sentiment in favor of forestry that has made itself manifest in these ways. It is an index of the intellectual standing of a community when the people take measures looking to its future welfare.

Besides the creation of forest reserves there is a second main branch of forest work in Hawaii that is directly of benefit to the sugar industry, as it is to all the people of the Territory—the planting of trees. Because of the prodigal methods by which the forests of the American mainland have been exploited, the people of the United States are face to face with a growing scarcity of wood that promises to amount to a timber famine.

Hawaii is very largely dependent on the mainland for its sup-

ply of wood products. All construction timber has to be imported and the local supply of even rougher grades is diminishing. This points the way with no uncertain finger to the desirability of establishing a local supply for at least a part of the wood used. Among the forest trees that have been introduced into Hawaii are several that are adapted to local needs, that grow fast and are easily started.

During the calendar year 1908 there was planted by a number of the leading sugar plantation companies and stock ranches a total of nearly half a million trees. Almost every plantation has waste land that could well be devoted to this use and the coming year will doubtless see the work greatly increased in scope. For those who plant trees now will be just so much the better off when the rising prices of wood come more keenly to be felt.

Forestry then has an important part to play in the life of the Territory. As one of the main factors in the field of Conservation it touches the industrial life of the community at many points. Land, water, and wood are fundamental needs in every community. The forests of Hawaii, native and introduced, help man to utilize the lands, to harness the streams to do his bidding, and to supply him with the wood that he needs in so many ways.

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